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AIR FORCE FLIGHT STANDARDS AGENCY
1535 COMMAND DRIVE, SUITE D-306
ANDREWS AFB, MD 20762-7002

AT-E-14

AIR TRAFFIC CONTROL TRAINING SERIES

EQUIPMENT

STANDARD COMMUNICATIONS
CONTROL SYSTEM

26 July 1993

FOREWORD

PURPOSE. This publication is for use in the training of USAF air traffic controllers and is not intended to replace, substitute for, or supersede official regulations, procedures, or directives.

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INTRODUCTION

This publication is designed to be used in conjunction with hands on training and classroom instruction to familiarize the aid traffic controller with the operation of the **OJ-314 (V) STANDARD COMMUNICAIONS CONTROL SYSTEM.** It does not replace TO 31W2-2FSC-167 or other maintenance technical orders which are the official directives for this equipment.

SECTION 1 - CONSOLE AMPLIFIER CONTROLS AND OPERATION.

SECTION 2 - RADIO SELECTOR -INDICATOR CONTROLS AND OPERATION

SECTION 3 - INTERCOM MONITOR-SELECTOR CONTROLS AND OPERATION.

SECTION 4 - TELEPHONE SELECTOR CONTROLS AND OPERATION.

SECTION 5 - OPERATOR-INSTRUCTOR JACKBOX.

SECTION 6 - REQUEST/ACKNOWLEDGE (R/A) CONTROLS AND OPERATION.

SECTION 7 - MASTER COMMUNICATIONS/SUPERVISOR POSITION CONTROLS AND OPERATION.

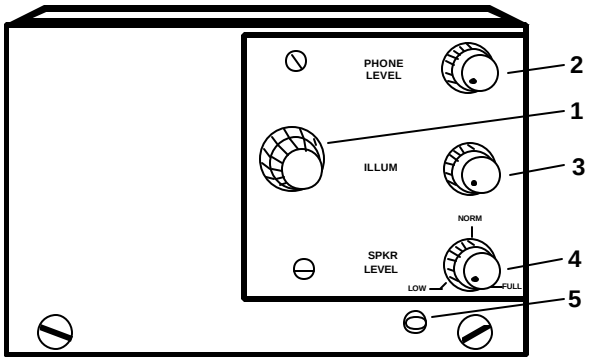
SECTION 8 - REMOTE RADIOS CONTROLS AND OPERATION.

SECTION 1

CONSOLE AMPLIFIER CONTROLS AND OPERATION

The amplifier provides amplification (volume) of all audio signals associated with the radio position. The front panel controls associated with the console amplifier are shown in Figure 1-1. The PHONE LEVEL control is used to adjust the volume of the receive audio signal applied to the HEADSET earphones. The **ILLUM** control is used to adjust the brilliance of the indicator lamps located in the different units at a position. Most of the indicator lamps will be controlled by the **ILLUM** control only when the corresponding indication (**IN/NOT IN USE**) is not present. If the **ILLUM** control is advanced clockwise there will be a point where all background lighting will be extinguished. The circuit key in use or the presence of an incoming signal/call will cause the lamp to glow brightly. When the status indicator is received, the indicator lamp will go to full brilliance regardless of the setting on the **ILLUM** control. The **SPKR LEVEL** (speaker) control is used to adjust the amplitude (volume) of the audio signal applied to the position loud -speaker. A screwdriver adjustment, accessible by removing the metal cap, is provided for adjusting the microphone amplifier audio threshold.

NOTE: This adjustment is normally made during installation and does not require further adjustment during normal operations.



NUMBER	NOMENCLATURE	FUNCTION
1	DS1	Provides illumination for edgelit panel.
2	PHONE LEVEL	Controls volume of headphone audio.
3	ILLUM	Controls brilliance of all position indicator lamps when associated signals are not present. When the control is advanced clockwise, there will be a point where all background lighting will be extinguished.
4	SPKR LEVEL	Controls volume of speaker audio.
5	R2	Controls microphone amplifier audio threshold.

Figure 1-1. Console Amplifier Controls and Operation.

SECTION 2

RADIO SELECTOR-INDICATOR CONTROLS AND OPERATION

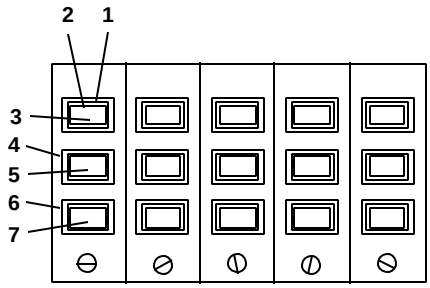
This radio selector is used to provide access to five separate radio channels. The number of units employed is variable between position and/or facilities.

1. **OPERATOR CONTROLS**. The operator controls associated with radio operation are shown in **Figure 2-1**. The upper pushbutton is used to select a particular radio channel. When this switch is depressed, the **GREEN** indicator lamp will be illuminated, indicating that the operator has selected the channel. A separate **AMBER** indicator lamp is also associated with the top pushbutton. This lamp will be illuminated when another position is using the radio channel.
NOTE: If an operator attempts to select a channel when the AMBER lamp is illuminated, the AMBER lamp will go to full brilliance and a busy tone will be present in the position headset.

2. **LOCKOUT MODES**. An operator may have control of a radio channel either when the channel is selected (Select Lockout Mode) or when the operator is actually keying on the channel (Key Lockout Mode). The two modes are selected by means of a separate switch, located on the radio selector unit behind the radio select card (Maintenance Function). In the Select Lockout Mode, only one position may select the radio channel. All other radio selector modules programmed to that channel will display an **AMBER** light. In the Key Lockout Mode, several different positions may select the channel at the same time. A **GREEN** lamp will be present at each position that has selected the channel. When one of the positions is keying (using the channel), the **GREEN** lamp at the other radio selector modules will go off and the **AMBER** light will be illuminated. If other operators with the channel selected attempts to key (transmit), they will receive a bright **AMBER** light and a buzzer. The radio selector modules that are programmed to the channel but have not selected the channel will receive only the **AMBER** indication.

3. **SWITCHING FEATURES**. The center pushbutton in the radio selector module is used to switch the receiver audio of selected radio channels from headphone to speaker. When this switch is not depressed, the audio will be connected to the headset and the **WHITE** indicator lamp will be at a partial brilliance. When the switch is depressed, the audio will be connected to the speaker and the **WHITE** indicator lamp will go to full brilliance. If an operator keys on the channel while the audio is connected to the speaker, the audio will automatically be switched to the headphone.

4. **MONITOR FEATURE.** The lower pushbutton is used to select a radio channel for **MONITOR ONLY**. When the lower pushbutton is depressed, the receiver audio will be connected to either the headphone or the speaker, depending on the status of the center switch. A voice operated (VOX) **YELLOW** indicator lamp is located behind the bottom switch. This lamp will be illuminated whenever an audio signal is present on the receive line. It should be noted that the operation of the **YELLOW** lamp is not dependent on the switch settings; it will be illuminated whenever an audio signal is present.



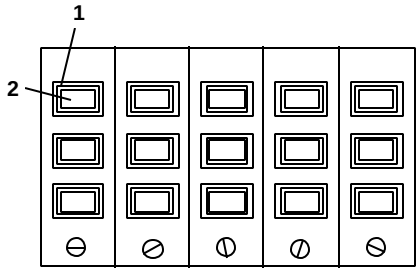
NUMBER	NOMENCLATURE	FUNCTION
1	PUSH-PUSH SWITCH	Selects radio channel.
2	INCANDESCENT LAMP	GREEN Lamp - Indicates channel has been selected.
3	INCANDESCENT LAMP	AMBER Lamp - At half brilliance indicates other position is using channel; full brilliance at a lock-out (Select or Key Lockout Mode).
4	PUSH -PUSH SWITCH	Switches receiver audio from head -phone to speaker.
5	INCANDESCENT LAMP	WHITE Lamp - At partial brilliance when receive audio is switched to headphone; full brilliance when receiver audio switched to speaker.
6	PUSH -PUSH SWITCH	Selects radio channel for monitor only.
7	INCANDESCENT LAMP	YELLOW Lamp -At half brilliance when (6) is depressed; changes to full brilliance when audio is present.

Figure 2 -1. Radio Selector- Indicator Controls and Operation.

SECTION 3

INTERCOM MONITOR-SELECTOR CONTROLS AND OPERATION

The Intercom Monitor- Selector, Figure 3-1, is used to provide operator access to a number of separate intercom or monitor channels. The Intercom Selector Module enables the operator to talk to an operator at another position. The operator initiates an intercom call by depressing the appropriate position pushbutton switch on the Intercom Selector Module. Depending on the option selected (speaker/headphone) the initiating operator's call will be received over the receiving positions headphone or position speaker. If speaker option is selected, the incoming call will be heard over the position speaker and will illuminate the **RED** indicator lamp. Also the called position monitor audio will be present in the calling position headphone. The called position answers the call by depressing the illuminated pushbutton. This will switch the incoming call from speaker to headphone and illuminate the lamp at the originating position. If headphone option is selected, the incoming call will automatically be connected to the called position headphone and both indicator lamps (calling and called position) will be illuminated. The Monitor Select Module enables an operator to monitor the audio output from another position. The operator selects a monitor channel by depressing the appropriate pushbutton on the Monitor Selector Module. This will connect the monitor audio from the selected position to the headphone of the operator and cause the **AMBER** indicator lamp to go full brilliance.



INTERCOM SELECTOR MODULE

NUMBER	NOMENCLATURE	FUNCTION
1.	PUSH-PUSH SWITCH	Selects Intercom Channel
2.	INCANDESCENT LAMP	**RED** Lamp - Partial brilliance during idle conditions. Full brilliance when in-coming call is received or when called position answers.

MONITOR SELECTOR MODULE

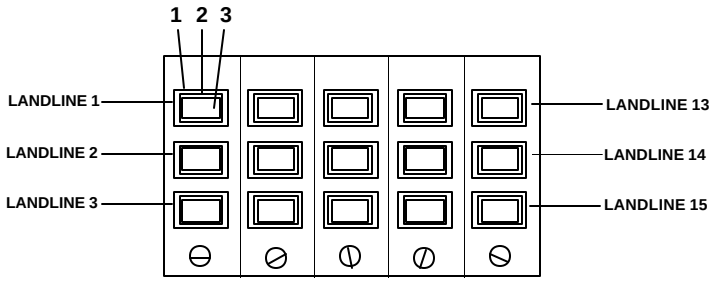
1.	PUSH-PUSH SWITCH	Selects Monitor Channel.
2.	**INCANDESCENT LAMP**	**AMBER** Lamp - Partia1 bri1liance during idle conditions. Full brilliance when monitor channel is selected.

Figure 3-1. Intercom Monitor-Selector Controls and Indicators.

SECTION 4

TELEPHONE SELECTOR CONTROLS AND OPERATION

1. **TELEPHONE SELECTOR**. Each telephone selector unit has the capability of providing the operator with access to fifteen telephone lines. The operator controls and indicators associated with telephone operation are shown in Figure 4-1. The pushbutton on the telephone selector unit is depressed to select a particular telephone line. A **GREEN** lamp associated with the switch will be illuminated when the telephone line is selected. An **AMBER** lamp, also associated with the pushbutton, will be at a partial brilliance during the idle condition. When the telephone line is busy (another position has selected the line), the **AMBER** lamp will go to full brilliance. A flashing **AMBER** lamp indicates an incoming call programmed to signal at another position. A flashing **GREEN** lamp indicates an incoming call programmed to signal at that position.



NUMBER	NOMENCLATURE	FUNCTION
1	MOMENTARY SWITCH	Selects telephone line when depressed.
2	INCANDESCENT LAMP	**GREEN** Lamp - Indicates telephone line has been selected; flashing **GREEN** indicates incoming call programmed to signal at that position.
3	INCANDESCENT LAMP	**AMBER** Lamp -At full brilliance indicates telephone line is busy; flashing **AMBER** lamp indicates in-coming call programmed to signal at another position.

Figure 4-1. Telephone Selector Controls and Operation

2. **TELEPHONE SIGNALING UNIT**. The signaling unit performs all of the signaling functions for the telephone lines except Automatic Signaling Unit (ASU) lines when the ASU is in the **AUTO** Position. The unit has twenty pushbuttons as shown in Figure 4-2 which perform the following functions:

a. **SIGNALING SWITCHES** - The switch assembly pushbuttons operate as ordinary telephone pushbuttons to dial a desired telephone number.

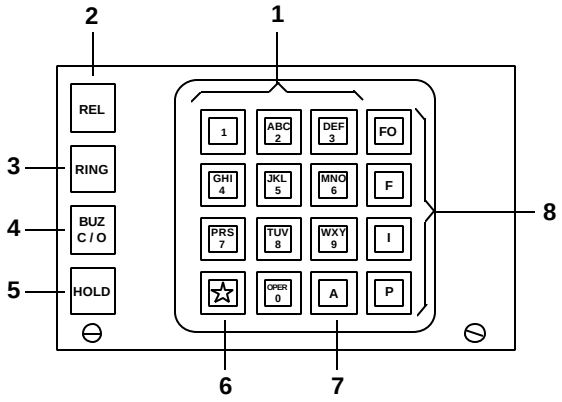
b. **REL** - The **REL** switch releases a line when a call is complete. It is a momentary-action switch and is backlighted **YELLOW**.

c. **RING** - The **RING** switch signals out on the ringdown type telephone lines when the Automatic Signaling Unit is in the **MANUAL** Position. The pushbutton in backlighted **GREEN**.

d. **BUZ C/0** - The **BUZ C/0** pushbutton disconnects the signal buzzer at the position. It is a press-on/press- off type switch and is backlighted **BLUE** when the buzzer is disconnected.

e. **HOLD** - The **HOLD** Switch holds a PBX line open while the operator completes a call on another line or selects an alternate line. The pushbutton is backlighted **AMBER**.

f. **PRIORITY SWITCHES** - FO, F, I, P, A and Star are used with direct access circuits only.



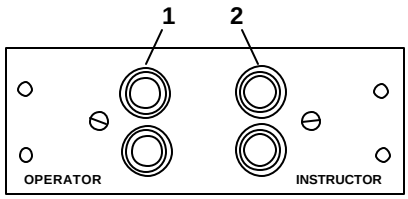
NUMBER	FUNCTION
1	Select Switches: Produces dial signals to PBX and SS-l lines. **WHITE** lamp.
2	Releases a previously selected telephone line. Momentary switch, **YELLOW** lamp.
3	Provides signal out (ring) on telephone lines in the manual mode. Momentary switch, **GREEN** lamp.
4	Disables audible buzzer. **BLUE** lamp.
5	Holds a selected lines or line with incoming call' open, while operator selects a second line. Momentary switch, **AMBER** lamp.
6	Not Used
7	Not used.
8	**Priority Switches:** Obtain priority on direct access circuits. **RED** lamp.

Figure 4-2. Telephone Signaling Unit Controls and Operation.

SECTION 5

OPERATOR-INSTRUCTOR JACKBOX

OPERATOR-INSTRUCTOR JACKBOX. This unit is located at each of the operating positions which enables an instructor/monitor to work along with the regular operator/trainee. During normal operation, the operator has complete control of the position. The instructor, through the **Operator-Instructor Jackbox**, monitors all audio at the position. If a problem occurs, the instructor/monitor can preempt the regular operator/trainee in radio by pushing his PTT switch and take control of the position while the regular operator/trainee will be limited to monitor only. In telephone and intercom, both operator/trainee and instructor/monitor can talk to the other party without pushing the PTT switch. The **Operator-Instructor Jackbox** is illustrated in **Figure 5-1**.



NUMBER	NOMENCLATURE	DESCRIPTION	FUNCTION
1	OPERATOR	DUAL PLUG-IN HEADSET JACK	Provides both receive and transmit audio through headset. Also provides keying function.
2	INSTRUCTOR	DUAL PLUG-IN HEADSET JACK	Provides both receive and transmit audio through headset. Instructor can also override operator.

Figure 5-1. Operator-Instructor Jackbox Jacks.

SECTION 6

REQUEST/ACKNOWLEDGE (R/A) CONTROLS AND OPERATION

The Request/Acknowledge (R/A) Panel, Figure 6-1, provides a means for a radar controller to inform a tower controller that an aircraft has entered a particular range segment. The R/A panel is made up of two columns of range/color indicators, each column has three different range/color indicators. The left column of range/color indicators represents the primary ranges and the right column represents the overflow ranges.

1. **REQUEST/ACKNOWLEDGE PANEL.** When an aircraft enters the outer range segment, a radar controller presses the primary **WHITE** range/color indicator. This causes the **WHITE** indicator on all R/A panels to flash continuously, and the respective radar terminal intercom on the tower R/A panels to flash continuously. The tower controller then presses the **WHITE** range/color indicator to acknowledge the aircraft entering the outer range. This causes the **WHITE** indicator to change to a steady state and the radar terminal intercom indicator to extinguish. When the aircraft enters the middle range segment, the radar controller presses the primary **AMBER** range/color indicator. When the primary **AMBER** indicator is pressed, the primary **AMBER** indicator starts flashing and the primary **WHITE** indicator extinguishes. The process is repeated with the **GREEN** range/color indicator for the inner R/A range segment. A steady range/color indicator can be extinguished by activating the next in sequence range/color indicator or by pressing the range/color indicator. The overflow range/color indicators are used only when the same light in the primary column is in use. When the primary light is extinguished, the overflow light shall revert to the primary column maintaining the same status and allowing the overflow column to be re-energized. The **RED** emergency alert indicator can be initiated by either the tower controller or the radar controller and can be acknowledged (steadying the **RED** indicator) only by the location that did not initiate the emergency. If a radar controller initiates an emergency alert, only that radar controller or tower controller can extinguish it after it has been steadied. If the tower controller initiates an emergency alert, any controller can extinguish the **RED** indicator after it has been steadied. When an emergency alert is initiated, the **GREEN** primary range/color indicator shall extinguish and the **GREEN** overflow indicator shall be inhibited from moving to the primary. All other range/color indicators shall continue normal operation. When the **RED** indicator is extinguished, an overflow **GREEN** indication shall automatically advance to the primary **GREEN** range/color indicator and all other range/color indicators shall continue normal operation.

NUMBER	NOMENCLATURE	FUNCTION
1	ILLUM	Varies the brightness of all **R/A** lighted switches except for the emergency **RED** lighted switch. The **ILLUM** control is also a spring-loaded, push -to- test switch used to light all R/A panel switches to verify their operation.
2	PUSH-TO-TALK (PTT)	The **PTT** is a momentary, pushbutton split-screen lighted (**GREEN/WHITE**) switch that permits voice communications from the radar controller to the tower controller. The **GREEN** portion of the switch indicates intercom is in use by the tower controller and is talking to another position. The **WHITE** portion of the switch indicates the tower is talking to your position and audio is received over the headset. Voice communication can then be returned by the radar controller pressing the **PTT** switch.
3	POWER ON/OFF	The **Power On/Off** switch is a lighted pushbutton switch that controls operating power to the **R/A** panel. The switch has a hinged guard to prevent accidental turnoff of the **R/A** panel during normal operations. The switch lights **BLUE** to indicate power is applied to the **R/A** panel.
4	RANGE INDICATOR	Pushbutton **GREEN** overflow range indicator.
5	RANGE INDICATOR	Pushbutton **AMBER** overflow range indicator.
6	RANGE INDICATOR	Pushbutton **WHITE** overflow range indicator.
7	RANGE INDICATOR	Pushbutton **WHITE** primary range indicator.
8	RANGE INDICATOR	Pushbutton **AMBER** primary range indicator.
9	RANGE INDICATOR	Pushbutton **GREEN** primary range indicator.
10	EMERGENCY ALERT	Pushbutton **RED** emergency alert indicator.

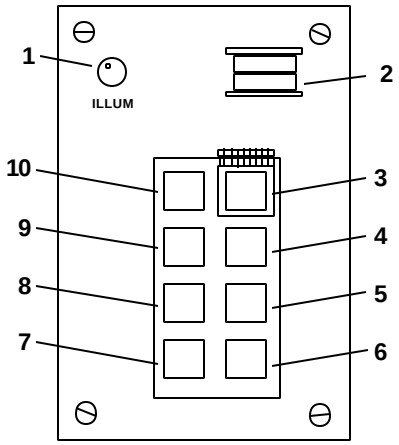


Figure 6-1. Request/Acknowledge Panel.

SECTION 7

MASTER COMMUNICATIONS/SUPERVISOR POSITION CONTROLS AND OPERATION

CONFERENCE PATCH PANEL UTILIZATION.

The purpose of the Supervisor Conference Patch Panel, Figure 7-1, is to enable the supervisor to conference with up to any four communications channels. This conference may be necessary in order to complete a communications link between the controller and more than one remote site, as well as providing a controller with a communication channel not normally terminated at that position.

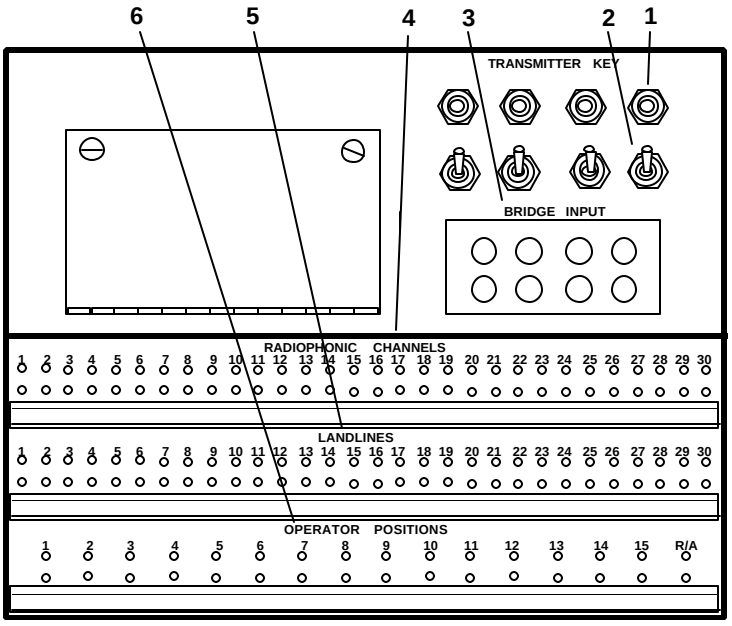


Figure 7-1. Master Communication/Supervisor Patch Panel.

NUMBER	NOMENCLATURE	FUNCTION
1	TRANSMITTER KEY LAMP	**GREEN** Lamp - Illuminates when corresponding switch is activated.
2	TRANSMITTER KEY CONTROLS	Four three-position toggle switches spring -loaded to the center position. With the switch in the up (not spring-loaded) position, the transmitter channel connected to the corresponding **BRIDGE INPUT** will be keyed and remain keyed until the toggle switch in placed back in the middle "disabled" position. Placing the switch in the down spring -loaded position accomplishes the same function as in the up position except the toggle switch must be held down manually and will automatically return to the middle "disabled" position when released.
3	BRIDGE INPUT CONNECTORS	Consist of four pairs of plug -in jacks. The jacks are used as connections for conference calls from the **RADIOPHONE CHANNELS** output, the **LANDLINES** output and/or the **OPERATOR POSITIONS** outputs to the bridging circuit.
4	RADIOPHONE CHANNELS CONNECTORS	Consist of 30 pairs of plug-in jacks. 1 pair of jacks for each available radiophone channel. The jacks are used to program radiophone channels for conference calls.
5	LANDLINE CONNECTORS	Consist of 30 pairs of plug -in jacks, 1 pair of jacks for each available landline. The jacks are used to program radiophone channels for conference calls.
6	OPERATOR POSITIONS CONNECTORS	Consist of 16 pairs of plug-in jacks. Jack pairs 1 through 15 are used to program each operator position for conference calls. The 16th pair of jacks, labeled R/A, is used to allow the control tower controller to enter conference calls.

The following are examples of the conference patch panel capability.

Radio/Landline/Operator 2 Conference.

A situation may arise in which an aircraft may need to communicate with a flight technician at a remote site.

To accomplish this network, the following connections and switch settings are made. The technician is contacted on landline by a controller. One patch cord between the **Landline Channel** and the **Conference Bridge Input** would be installed. The controller who is connected to the remote operator on **Landline** will also be included in the conference. The supervisor should select the **Radio Channel** at the supervisor console so an "in use" signal will be present at all positions. In order to transmit over the **Radio Channel**, the transmit key on the **Bridge Input Panel**, associated with the **Radio Channel**, must be activated.

Landline/Landline/0perator Conference.

A situation of two remote parties being conferenced with an operator through landline channels.

To accomplish this network, the following connections and switch settings are made. The two remote parties are contacted on the **Landline Channels** which will be conferenced. One patch cord between one of the **Landline Channels** and the **Bridge Input Panel** would be installed. One patch cord between the other **Landline Channel** and the **Bridge Input Panel** would be installed. The two remote operators are now conferenced together with the controllers.

Operator/Landline or Operator/Radio Conference.

Each controller has a limited number of communication channels and in certain cases a limited type. Should a controller need to use or participate on a channel that is not programmed to the position, the conference patch panel may be used.

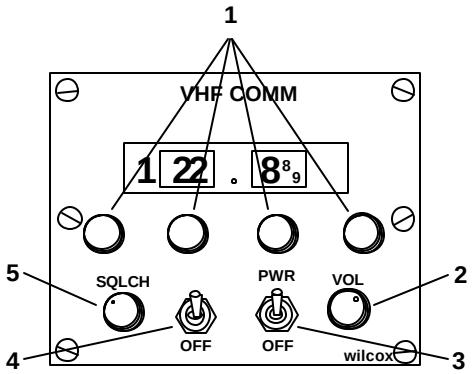
The controller should establish intercom communications with the supervisor in the normal manner. A patch cord will be placed between the **Controller Position** and the **Bridge Input Panel**. Another patch cord will be installed between the **Radio or Landline Channel** desired and the **Bridge Input Panel**.

For radio communications, the channel should be selected at the supervisor's console so an "**in use**" signal will be present. In addition, the **Transmit Key** on the **Bridge Panel** must be activated for the controller to transmit audio.

For **Landline Communications**, the remote operator must be contacted by a position with the landline capability. Once the connection has been made, the conference is established.

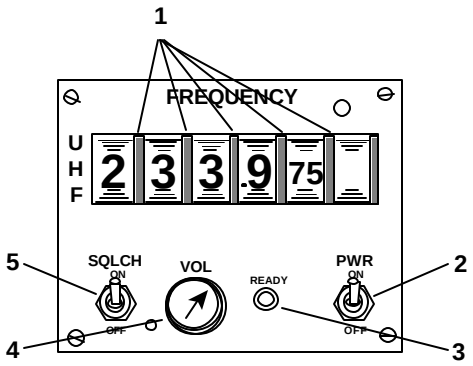
SECTION 8

REMOTE RADIO CONTROLS AND OPERATION



NUMBER	NOMENCLATURE	FUNCTION
1	FREQUENCY SELECTOR	Consist of four rotary switches. These switches select the operating frequency of the VHF transceiver, from 116.00 through 149.95 MHz. There is one switch each for the tens, units, tenths, and hundredths digits. The hundreds digit is set at 1. The frequency selection is in 50-KHz increments. The selection of frequencies 110.00 up to 116.00 will disable the VHF transceiver.
2	VOL	Adjusts (clockwise to increase) the level of receive audio from the VHF transceiver to the controller's headset and/or speaker.
3	PWR/OFF	A two-position toggle switch. The switch is used to turn on/off the VHF transceiver. With the switch in the **PWR** position, the VHF transceiver is on. With the switch in the OFF position, the **VHF** transceiver is off.
4/5	SQLCH	A two-position toggle switch and variable control. The **SQLCH** controls are used to reduce or eliminate interference from the received signal. The switch is used to turn on/off the squelch function. With the switch in the **SQLCH** position, the squelch is on. With the switch in the **OFF** position, the squelch is off. The variable control is used to set the threshold at which the interference is reduced or eliminated.

Figure 8-1. VHF Remote Radio Controls and Operation.



NUMBER	NOMENCLATURE	FUNCTION
1	FREQUENCY	Five thumbwheel switches with corresponding digits. The switches select the operating frequency of the UHF transceiver. There is one switch each for the hundreds, tens, units, and tenths digits. The fifth thumbwheel switch selects the hundredths and thousandths. The selection of frequencies 200.000 up to 225.000 will disable the UHF transceiver.
2	PWR-ON/OFF	A two-position toggle switch. The switch is used to apply or remove power to the UHF transceiver. With the switch in the **ON** position, the UHF transceiver is on. With the switch in the **OFF** position, the UHF transceiver is off.
3	READY	Lights **GREEN** to indicate the UHF transceiver is tuned to the selected frequency and is ready to transmit and receive.
4	VOL	Adjusts the level of receive audio from the UHF transceiver to the controller's headset and/or speaker. A Counterclockwise notation of the control lowers while a Clockwise rotation raises the audio level.
5	SQLCH-ON/OFF	A two-position toggle switch. The switch is used to reduce or eliminate interference from the received signal. With the switch in the **ON** position, the squelch function is on. With the switch i n the **OFF** position, the squelch function is off.

Figure 8-2. UHF Remote Radio Controls and Operation.